IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Huan-Yu Su
Serial No.:   09/627,375
Filed: July 28, 2000
Art Unit: 2654
Examiner: Han, Qi
TITLE: Flexible Variable Rate Vocoder for Wireless Communication Systems

APPLICANT'S DECLARATION UNDER 37 C.F.R. § 1.131

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Assistant Commissioner:

RECEIVED

APR 2 3 2003

Technology Center 2600

I, Huan-Yu Su, declare as follows:

1.   I am the inventor of the subject matter described and claimed in the above-referenced United States Patent Application Serial No. 09/627,375, filed July 28, 2000, entitled "Flexible Variable Rate Vocoder for Wireless Communication Systems".

2.   I declare that I conceived invention of the subject matter of the above-referenced application in the United States, as defined by its pending claims 1-11 and 28-37, prior to October 26, 1999.
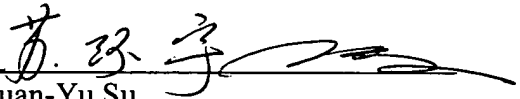
3.   To evidence conception of invention of the subject matter of the above-referenced application in the United States, attached hereto, please find a copy of the Innovation Disclosure describing my invention having Docket No. 99RSS293, which was submitted to Conexant Innovation Disclosure Database on June 3, 1999.

4.   I declare that the enclosed Innovation Disclosure evidences conception of invention of the subject matter of the above-referenced application in the United States prior to October 26, 1999.

5.   I declare that the present invention, as defined by claims 1-11 and 28-37 pending in the above-referenced application, was reduced to practice at Conexant Systems, Inc., located at 4311 Jamboree Road, Newport Beach, California 92660, using due diligence after conception of invention of the subject matter of the above-referenced application.

6.   I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine of imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-referenced patent application or any patent issuing thereon.

April 10, 2003
Date

_____
Huan-Yu Su
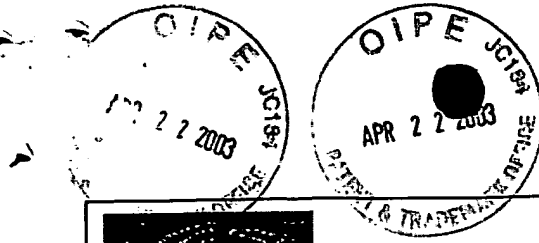
Innovation

Disclosure

Docket No.:   99RSS293
Ranking: APPROVED TO FILE

1. Innovator(s)

Name	SSN	Dept.	Mail Code	Telephone	Supervisor
Huan-Yu Su	Redacted	889	k02-250	(949)483-6365	Jim W Johnston

2. Title of Invention

Network Configurable Multi-Mode Vocoder

3. Problem Solved

With the tremendous growth of number of cellular subscribers over the last few years, it is becoming more and more obvious that the number of users for a particular cell exhibits a great variation from time to time. Oftentimes, not being able to make a call due to capacity limit of the network will cause significant impact to the overall perception of the service quality from a user point of view. It is therefore essential for network to provide adequate capacity.

Over the last decade, cellular industry handles the capacity increase by means of lowering the speech coding rate. This is a very effective way to improve the capacity of the network, for example, QCELP-13k provides 6 times capacity as compared to analogue AMPS, while EVRC-8.5k gives 10xAMPS capacity gain. However, with this fixed lower bit-rate approach, the service quality is reduced permanently for the network.

How to dynamically use the available radio resources to reach the best tradeoff between capacity and quality of service on the network is the goal of this invention.

4. Previous Solutions

In today's CDMA system, the speech coding rates are fixed. For example in IS-127 the bite-rates are 8.5k (full-rate), 4.0k (half-rate), 2.0k (quarter-rate) and 0.8k (eighth-rate). Depending on the input speech characteristics, a rate determination algorithm will choose the appropriate rate to be used for a particular time. The network capacity directly depends on the average bit-rate used by all the users of a given cell.

Unfortunately, because of the poor quality of the half-rate, only the full-rate is used for active speech and the eighth-rate is used for inactive speech. And the rate determination algorithm acts almost like a simple voice activity detector, therefore resulting in a fixed rate determination approach without network configurability.

5. Solution

It is the present invention's goal to address the following needs.

1) When the number of active users is far away from network saturation, the radio resources could be used for improving the communication quality by means of using higher percentage of full-rate coding rate, even for inactive speech signals.
2) However, when the number of active users increases, the network should be able to configure all the users to use a reduced average bit-rate in order to free more radio resources by means of using more and more half-rate/quarter-rate.

And this process should be done gradually. Of cause the use of half-rate and quarter-rate should only generate graceful degradation in speech quality.

3) In a stronger than usual capacity need situation, the network should be able to request all users only use the half-rate as maximum coding rate.

4) When de demand decreases, the network should be able to increase all users' average bit-rate in order to improve the service quality again making use of the available radio resources.

In order to achieve this goals, one strong requirement on the speech codecs is that the switching between different bit-rates is possible at any moment in time and no audible degradation is generated from the switching process. There are two more requirements on the spech codecs: a) both the half-rate and quarter-rate codecs result in acceptable speech quality; b) with higher and higher percentage of half-rate or quarter-rate usage, the degradation to the speech quality is gradual. Once all these requirements are satisfied, then network can operate as the following:

<u>For premium users</u>:

Network will always allow them to use a high average bit-rate configuration, but these users will have to pay more for a better service quality.

<u>For normal users</u>:

1) Network monitors the number of active users for a given time. If more capacity is needed, then the network will send a flag to all users requesting them to lower their average bit-rate. Once the mobile receives the request, the rate determination algorithm will use a different set of parameters.

2) If there is a surplus of capacity, then the network will send a flag to all mobiles allowing them to increase the average bit-rate. Once the mobiles received the command, the rate determination algorithm will use a different set of parameters.

<u>For low-cost users</u>:

the network will force them to use a lower average bit-rate as compared to the normal users for a given time. They will also be subject to average rate change, as normal users will.

The moment of rate change is not needed to be communicated to the receiving end in order to increase robustness against channel loss.

Note: this invention is applicable to the CDMA environment. For TDMA the situation is more complecated.

6. Differences/Advantages Over Previous Solutions

Flexibility for network operators. Overall optimum quality for a given condition. Potential different pricing structure.

7. Status of Innovation

In design If "Other", please specify

8. Product or program in which innovation will be used:

3G competition

9. Has anyone disclosed or does anyone plan to disclose your innovation outside the Company?

● Yes   ○ No   ○ Don't Know

If "Yes", where:
In the 3GPP2/TR45.5.1.1 standardization committees
We are also planning to disclose our design to Airtouch, Samsung, DENSO, etc. in order to gain their support. The time

frame could well be in July.

10. Has anyone proposed or does anyone plan to propose a product or program to a customer which includes your innovation?

● Yes   ○ No   ○ Don't Know

If "Yes", when and how: We are building a candidate for the competition of the SMV (selectable mode vocoder). Our candidate is due in November, 1999.

11. Innovator signature(s): (Do not use black ink)

_____ Date _____

Entered: Huan-Yu Su/USA/Conexant @ 06/03/99 10:00 AM
Modified: Donna Bastedo @ 09/24/99 05:43 PM

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Revised: 03-Jun-1999   12:31 PM by Huan-Yu Su
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              06-Jul-1999   02:54 PM by James K Dawson
              24-Sep-1999   05:43 PM by Donna Bastedo